Punishing and toxic neighborhood environments independently predict the intergenerational social mobility of black and white children

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Contributed by Robert J. Sampson, February 25, 2019 (sent for review December 4, 2018; reviewed by John M. MacDonald and Bruce Western)

We use data on intergenerational social mobility by neighborhood to examine how social and physical environments beyond concentrated poverty predict children's long-term well-being. First, we examine neighborhoods that are harsh on children's development: those characterized by high levels of violence, incarceration, and lead exposure. Second, we examine potential supportive or offsetting mechanisms that promote children's development, such as informal social control, cohesion among neighbors, and organizational participation. Census tract mobility estimates from linked income tax and Census records are merged with surveys and administrative records in Chicago. We find that exposure to neighborhood violence, incarceration, and lead combine to independently predict poor black boys' later incarceration as adults and lower income rank relative to their parents, and poor black girls' teenage motherhood. Features of neighborhood social organization matter less, but are selectively important. Results for poor whites also show that toxic environments independently predict lower social mobility, as do features of social organization, to a lesser extent. Overall, our measures contribute a 76% relative increase in explained variance for black male incarceration beyond that of concentrated poverty and other standard characteristics, an 18% increase for black male income rank (70% for whites), and a 17% increase for teenage motherhood of black girls (40% for whites).

social mobility | neighborhood | toxicity | violence | incarceration

The extent to which growing up in a disadvantaged neighborhood influences one's opportunities later in life has generated a large and important body of research (1–4). The effect of concentrated neighborhood poverty, as distinct from personal poverty, has been the main focus of inquiry in this tradition (1, 3, 5). More recently, researchers have examined the social processes and mechanisms through which neighborhood contexts are thought to matter, such as social control and cohesion (6, 7), exposure to violence (8–10), incarceration (11, 12), and toxic environmental hazards (13, 14).

In a landmark set of papers based on longitudinal records from more than 20 million children, Chetty et al. (15–18) explore how neighborhoods and race shape contemporary opportunity in the United States. A widely reported finding is that black children born to parents in the bottom household income quintile have only a 2.5% chance of rising to the top quintile of household income compared with a 10.6% chance for whites from similar family backgrounds. However, there is substantial within-race variability across neighborhoods in this result, along with those for other outcomes such as adult incarceration, and there is convergent evidence that some of this variation is because children's outcomes are causally affected by the neighborhood environments in which they grow up (15, 16). Black children who move to better neighborhoods, those that have low poverty rates, high levels of same-race father presence, and low levels of white racism, do better on average for every year that they spend in those neighborhoods (18). However, there are massive disparities between blacks and whites in access to beneficial neighborhoods. Of US children born in the late 1970s and early 1980s, about 63% of white children but only 4% of black children grew up in the types of neighborhoods most likely to foster success in the form of upward intergenerational mobility (18). This set of findings motivates our analysis of neighborhoods and intergenerational mobility.

Research Strategy and Key Findings

In this article, we use newly developed data from the Opportunity Atlas (19) to examine previously unexplored pathways through which neighborhoods are hypothesized to shape the intergenerational social mobility of children who grow up in them. We propose two classes of mechanisms beyond those analyzed by Chetty and colleagues.

First, we examine how neighborhoods that are harsh on children's development, those characterized by high rates of violence, incarceration, and lead exposure, are associated with key aspects of social mobility. These punishing and toxic environments have been linked in prior work to the instability of neighborhoods and families, the blunting of cognitive development, and a diverse set of behavioral problems among children and adolescents (9–11, 14, 20, 21). Our argument is that traditional measures of disadvantage provide an incomplete picture of the adverse environments that pose direct physical and mental harms to children's development, and thereby impede social mobility.

Second, we examine dimensions of neighborhood social organization that are hypothesized to promote the development of children and that may protect against environmental adversity, such as informal social control, cohesion and trust among neighbors, and organizational participation. These features of neighborhoods, which have not been studied with respect to social mobility, provide potential supportive mechanisms during

Significance

Growing up in neighborhoods with concentrated violence, incarceration, and lead exposure predicts lower intergenerational income mobility and higher adult incarceration of poor black males, after accounting for commonly studied factors such as concentrated poverty and racial composition. Similar patterns emerge for the income mobility of poor white children and teenage birth among both poor black and poor white girls. In Chicago, harsh environments are also racially segregated, with little overlap in exposure rates for blacks and whites: virtually all majority black Census tracts are more exposed to hazards than any majority white tracts. This large difference in exposure rates plausibly accounts for a substantial portion of racial disparities in intergenerational inequality (20–60%).

Author contributions: R.M. and R.J.S. designed research, performed research, analyzed data, and wrote the paper.

Reviewers: J.M.M., University of Pennsylvania; and B.W., Columbia University.

The authors declare no conflict of interest.

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This article contains supporting information online at www.pnas.org/lookup/suppl/doi:10.1073/pnas.1820464116/-/DCSupplemental.

Published online April 1, 2019.

the transition to adulthood, fostering improved life chances, especially in risky environments.

To assess these neighborhood features, we merge Census tract-level estimates of child mobility in the city of Chicago, created from linked income tax and Census records (19), with measures of the social and physical environment constructed from the Project on Human Development in Chicago Neighborhoods (PHDCN) and follow-ups (22). We focus on race-specific mobility outcomes and racial disparities in both harsh and supportive environments, given the vast racial disparities in mobility found by Chetty et al., and especially their call for research to examine the sources of variation in black men's outcomes across neighborhoods.

We show that, in Chicago at least, harsh social and physical environments, and especially exposure to violence, incarceration, and lead, are important independent predictors of both black male and white children's later income rank relative to their parents, black male adult incarceration, and teenage motherhood among both black and white girls. Although features of neighborhood social organization are comparatively less predictive in direct terms, they are selectively important for blacks and whites beyond Census characteristics. Overall, our measures add significantly to the explained variance in mobility outcomes, substantially reducing the magnitude of traditional predictors such as poverty.

Similar to most research in this area, we cannot establish causality, but our results indicate that social and physical environmental features should be considered and tested as important mechanisms through which more commonly studied indicators of neighborhood disadvantage, such as the poverty rate or the fraction of families headed by single parents, operate. They also may be independent drivers of variation in child outcomes, providing a potential explanation for the national mobility differences by race described in earlier work with the Opportunity Atlas data (18, 19).

We further show that in Chicago, the spatial distribution of environmental hazards is tightly clustered and aligns with the city's intense racial segregation, such that there is almost no overlap in exposure rates for blacks and whites: Virtually all majority black tracts are more exposed to hazards than any majority white tracts. This difference in exposure is large enough to plausibly account for a substantial portion of racial disparities in intergenerational inequality. According to our model, for example, if the poor black boys in our sample had been exposed to the toxicity levels experienced by their white peers, their predicted likelihood of incarceration after controlling for parent income would have been 5.8 percentage points lower, or almost 60% of the gap between blacks and whites in our sample.

Materials and Methods

The Opportunity Atlas data are constructed from an individual level panel dataset that links federal tax returns from 1989, 1994, 1995, and 1998–2015; responses to the 2000 and 2010 decennial Censuses; and responses to the 2005–2015 American Community Surveys. This dataset covers ∼96% of the 1978–1983 birth cohorts. Children are matched to parents based on who claims them as a dependent in tax returns (19). Extending Chetty et al. (15, 18), in the *SI Appendix*, sections 1 and 2, we describe how we adjust estimates for parental income, preserve anonymity, weight the data, and scale the explained variance statistics to reflect measurement reliability for our sample.

Our analysis focuses on the expected outcomes for children with parents at the national 25th percentile. The main outcomes we examine are: individual income rank in 2014–2015 for black boys, when they were aged 31–37 years; the expected fraction of black boys incarcerated on April 1, 2010; and the expected fraction of black girls who had children as teenagers. Each of these outcomes is of fundamental interest to researchers in the social sciences.

Our explanatory variables are constructed from the Census; the Community Survey of the PHDCN, which interviewed a representative sample of Chicago residents about their neighborhood social environments in 1995 and 2002 (combined N of ∼12,000); violent crime rates per 100,000 population from 1995 to 2000, derived from offenses reported by citizens to the police; incarceration rates per population from 1995 to 2000, derived from prison admission data; and lead exposure among children from 1995 to 1997, derived from more than 150,000 blood-level tests conducted by Chicago's health department. Lead exposure is defined as the proportion of children with average blood-lead level readings of 6 μg/dL or higher, above the Centers for Disease Control and Prevention level of concern (13). We control for neighborhood variations in the proportion of children tested by the city in all results presented. Because lead decays slowly in the soil (14), our measurement of lead exposure in the mid-1990s is also a proxy for variation across tracts in lead levels before that point.

We created explanatory variables measured during the middle and second half of the 1990s whenever possible. This places the neighborhood measurements near the middle of the period from which the mobility estimates were calculated, and when the cohorts in our sample were in adolescence. For example, the youngest cohort in our data grew from age 12 to 17 years from 1995 to 2000, whereas the oldest grew from age 17 to 22 years. Recent research on these social mobility data shows that the effects of neighborhood context are somewhat stronger in adolescence than in early childhood (19). Similar to Chetty and Hendren (15), and consistent with past research on Chicago neighborhoods in the 1990s (22), we assume that relative differences between neighborhoods in our measured characteristics are reasonably stable during the period of measurement.

Both the Census and the PHDCN are high-dimensional data sources with strong correlations among many of their variables. This clustering is meaningful and reflects the neighborhood conditions that work in combination to impair health and human development. Therefore, to produce interpretable results, we attend to the number of underlying dimensions in the data and the possible collinearity among variables. Our strategy is to examine a mix of composite factors and representative indicators that capture the essential meaning of each factor.

From the Census, we conduct a principal components factor analysis for the entire nation of the following variables: proportion of residents in 1995 identifying as black or African American, proportion of residents identifying as Hispanic or Latino, proportion of residents who were foreign born, proportion of residents who were children, proportion of families headed by a single parent, the poverty rate, and proportion of residents with a college degree (values for 1995 are linearly interpolated between 1990 and 2000). From the Opportunity Atlas and Census, we also examine population density and the share of homeowners in 2000.

This strategy produces three factors: one defined by poverty, single parents, and black population; one capturing foreign-born and Latino populations; and one positively correlated with the share of the population younger than 18 years and negatively correlated with the fraction that are college educated. To be consistent with past research on intergenerational mobility, we begin by including raw variables that strongly indicate each factor: the shares of residents who are poor, foreign-born, college-educated, and black. We use poverty rather than single parenthood in our primary analysis because of the longstanding focus in prior neighborhood research on concentrated poverty. Because a child's family poverty is captured by our income adjustment at the individual level, this strategy allows us to estimate the contextual or independent role of neighborhood poverty. Similarly, we incorporate racial composition at the tract level in our race-specific mobility estimates by including the percentage of tract residents who are African American as its own explanatory variable. However, in *SI Appendix*, Tables S7 and S8, we present the full set of results, using the factors themselves, which are very similar. Our goal is to provide a comprehensive set of Census control variables when assessing the associations of organizational and environmental features with social mobility.

The PHDCN Community Survey variables were originally calculated for Census 2000 tracts, which we match to Census 2010 tracts using the Longitudinal Tract Database (23), weighting by the proportion of the 2010 tract's population found in each 2000 tract. We examine eight scales of the social environment at the tract level: intergenerational closure (ties connecting adults and children), cohesion among neighbors, informal social control, disorder (e.g., graffiti, drinking in public), reciprocated exchange among neighbors, friend and kinship networks, participation in community organizations, and active contact with organizational leaders to solve local problems. Similar to the Census analysis, we conduct a factor analysis on the mean of tract values of these eight variables in 1995 and 2002, which produces three factors. The first is consistent with past research on collective efficacy (6), defined by adult–child monitoring (closure), cohesion, control, and negatively on disorder (for simplicity, we label this factor "social control"); the second is defined by personal networks and exchange ("local networks"); and the third is defined by organizational participation and activism in organizations solving local problems ("community organizations").

More than the social organization features of support, there are high correlations at the tract level among violent crime, incarceration, and lead exposure, a reflection of the way multiple reinforcing hazards are concentrated in disadvantaged and segregated communities (24). The correlation matrix of these predictors is shown in *SI Appendix*, Table S1. The citywide correlations are 0.78 and above, although correlations within majority black or majority white tracts are lower (second and third panels). The correlations for our regression samples are in between, but are closer to those citywide.

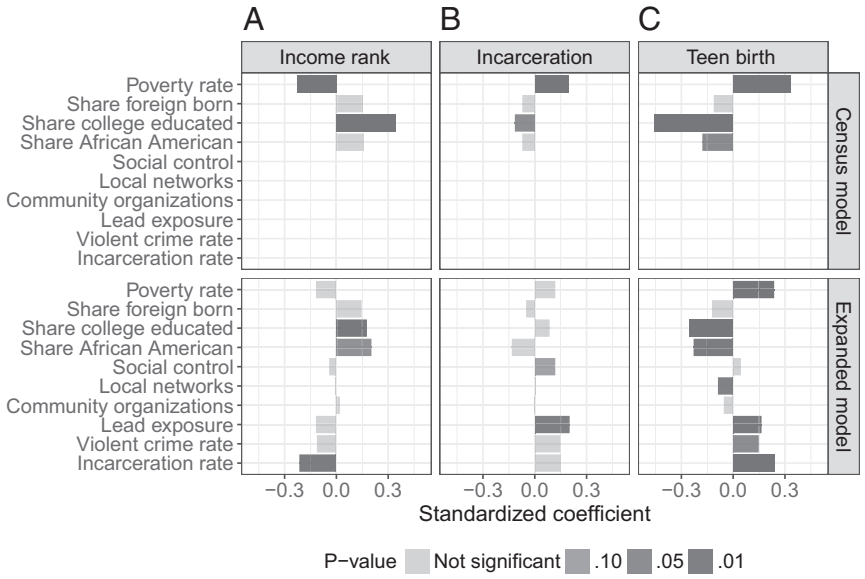

Fig. 1. Predictors of intergenerational mobility of black children: adult income rank for black males (*A*), $n = 430$; incarceration of black males (*B*), $n = 402$; teenage birth among black females (*C*), $n = 438$. The unit of analysis is the Census tract. The first block of coefficient estimates is from a standard model of Census variables, and the second block shows an expanded model, adding PHDCN variables.

The overlap among indicators, especially citywide and in our models, again suggests that we should think of neighborhood environments not only in terms of separate explanatory variables but also as clusters of conditions that impair human development. Put differently, our measures are perhaps better thought of as different aspects of one underlying or latent concept of "hazards," "harshness," or "neighborhood toxicity." However, because the constituent indicators carry different connotations, are believed to originate from different processes, are somewhat less clustered in racially segregated tracts, and are commonly separated in prior research, we include them as separate predictors in our initial analysis, after which we examine a summary measure of "harsh/toxic" environments that captures the common variance among the predictors. An advantage of this twofold strategy is that it allows us to assess whether the associations of traditional predictors such as poverty change, depending on the measurement structure of harsh and toxic environments.

Results

Chicago parallels the United States as a whole (18), in that blacks and whites are exposed to vastly different residential contexts. The city is extremely segregated: of the 754 Census tracts for which we have data on either black or white boys in Chicago, just 133 have sufficient numbers of both races to permit within-tract comparisons. Further, the Census tracts containing black and white children are qualitatively different environments. This is true whether measured by the characteristics of the tracts in the 1990s or by the outcomes of children who grew up in them. For the expected individual income rank for men raised at the 25th percentile, the 90th percentile of majority black tracts is less than the 10th percentile of majority white tracts. The tract distributions of outcomes by majority race are shown in *SI Appendix*, Fig. S1.

Because residential segregation makes it nearly impossible to directly and reliably compare blacks and whites growing up within the same Census tracts, we focus our attention first on attempting to explain variation within the African American population. We later compare these results with variation among whites. This strategy follows the logic of the Chetty et al. (18) findings on racial inequality, particularly the distinct pattern for black men. Similarly, for each outcome, we adjust for parent income by analyzing the expected outcome for children whose parents were at the 25th percentile. There is considerable variation across the city: among majority African American Census tracts, for instance, the expected income rank for a boy with parents at the 25th percentile varies by more than 19 percentage points.

SI Appendix, Fig. S2 plots the two-way relationships between the outcome variables, the three PHDCN social environment factors, and the three indicators of exposure to crime and toxic environments. In general, we see patterns consistent with our expectations. Intergenerational income mobility is lower, and both teenage childbearing and incarceration are higher, in childhood neighborhoods characterized by lower levels of social control and organizations, and in neighborhoods with high rates of violent crime, incarceration, and lead exposure. Some relationships are substantial, particularly for the indicators of harsh environments. For example, the likelihood of teenage motherhood among black girls is correlated with the incarceration rate, at 0.49.

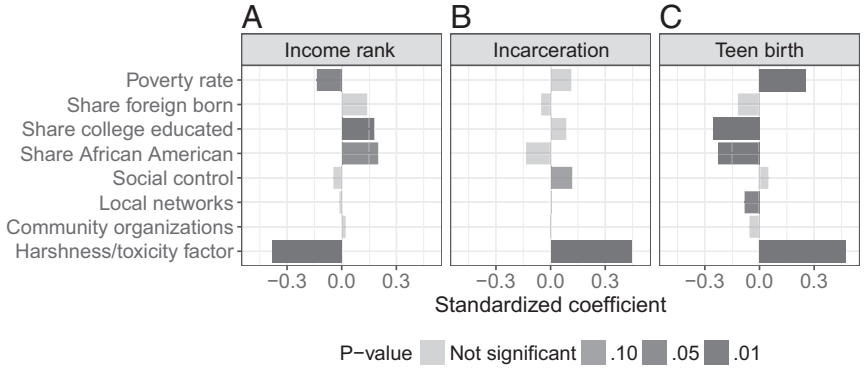

Fig. 2. Expanded model of intergenerational mobility of black children with toxicity/harshness factor. Male income rank (*A*), $n = 430$; male incarceration (*B*), $n = 402$; female teenage birth (*C*), $n = 438$.

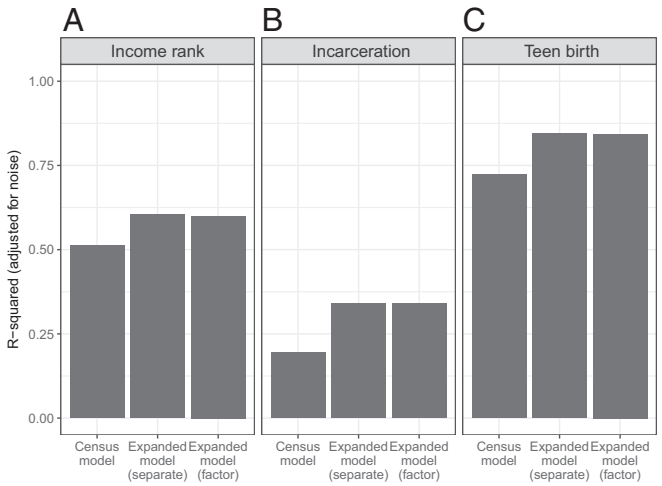

Fig. 3. Explained variance of standard and expanded models for black male income rank (*A*) and incarceration (*B*), and female teen birth (*C*).

How do these factors work together in concert with traditional neighborhood predictors such as single parenthood, racial composition, or poverty? We preface our analysis to underscore that, similar to Chetty et al. (18), we do not place a causal interpretation on our estimates. Although the results may well reflect causal patterns, strictly speaking we are focusing on the prediction of adult outcomes from childhood environments. Also, some part of the association of parental income with children's outcomes is plausibly a result of neighborhood influences on parents. In that sense, our models may be overcontrolling for family income.

There are at least two ways in which a new set of measures might improve our understanding, both of which are of interest. The first is by increasing the overall predictive power of the model, or the total variation in the outcome that can be explained. This is captured by improvements in the R^2 of the model or in out-of-sample prediction accuracy, indicating that the new measures explain a portion of the variation in the outcome that none of the old variables could explain. We formally test for this possibility, using an F-test of the joint significance of our variables.

The second possibility is more interpretive, in that a new variable may better explain the portion of variation that was captured by the old analysis. In this case, the predictive power of the model may stay roughly the same, but it becomes clear that variation thought to be driven by one variable is driven by the newly added variable. This is akin to exposing confounding, which will result in decreases in the magnitude of coefficients and significance levels of the original variables.

Predictors of Mobility Outcomes for African American Children. Fig. 1 presents the coefficients from our analysis of tract-level predictors of mobility outcomes for black children. The top row shows estimates from our model with Census variables only, whereas the bottom row shows the expanded model that also contains the PHDCN measures. Exact coefficients and significance levels are in *SI Appendix*, Table S5.

We first examine individual economic outcomes, the primary outcome explored by Chetty et al. (18). As shown in column A of Fig. 1, in a model with the four Census variables, tract poverty rate and share college educated are significant predictors, with poverty negatively associated with adult income and college share positively associated. This is as expected. But once the expanded variable set is included (bottom set of rows), the predictive power of poverty drops dramatically and is no longer significant at all, whereas the magnitude of the coefficient on share college-educated drops by half. Meanwhile, the predictive power of the incarceration rate is both highly statistically significant and quite large in magnitude: With higher levels of punitiveness comes lower income mobility, all else equal.

This finding is an instance in which the additional variables are better at explaining the outcome than the original variables. As shown in Fig. 3*A*, the overall explanatory power of the model increases as well, with the reliability-adjusted R^2 rising from 0.51 to 0.60, a relative increase of 18% [F(7 degrees of freedom) = 3.58; $P = 0.0009$].

The results for likelihood of the child's incarceration are similar, but with specific differences in predictors. These are presented in Fig. 1, column B. When only Census variables are included, the poverty rate is highly significant as a predictor, and the college-educated population is moderately significant. But when the expanded measures of social and physical environment are included, neither is significant, whereas exposure to lead in the environment is highly significant. Interestingly, after accounting for neighborhood hazards, neighborhood social control has a slight positive relationship with the likelihood of incarceration, although this result is highly sensitive to specification choices. Adding the PHDCN variables substantially improves the explanatory power of the model. The reliability-adjusted R^2 of the Census-only model is 0.19, whereas the R^2 in the expanded model is 0.34, which is 76% larger [$F(7) = 3.47$; $P = 0.0013$; see also Fig. 3*B*].

The models of teenage pregnancy among female children (Fig. 1*C*) show that the magnitudes of the coefficients on poverty rate and share college-educated again decrease substantially once exposure to environmental hazards is accounted for, whereas all three measures of neighborhood harshness/toxicity are highly significant, as is the measure of local network use, which predicts lower teenage birth. In addition, the overall explanatory power of models with the environmental variables is higher than those without [$R^2 = 0.85$ vs. 0.72; $F(7) = 9.32$; $P < 0.0001$].

As noted earlier, the correlations among lead exposure, incarceration, and violent crime are quite high, adding imprecision to their estimates in Fig. 1. But more than just imprecision, the spatial clustering is meaningful. Consistent with this claim, when we conducted a factor analysis, each variable loaded on the one factor at above 0.9 (0.97 for incarceration rate, 0.92 for lead, and 0.95 for violence). Substantively, this means that children are simultaneously exposed to these three neighborhood characteristics in tightly bound ways. We therefore combine lead exposure, incarceration, and violent crime rates into one "neighborhood harshness/toxicity" factor

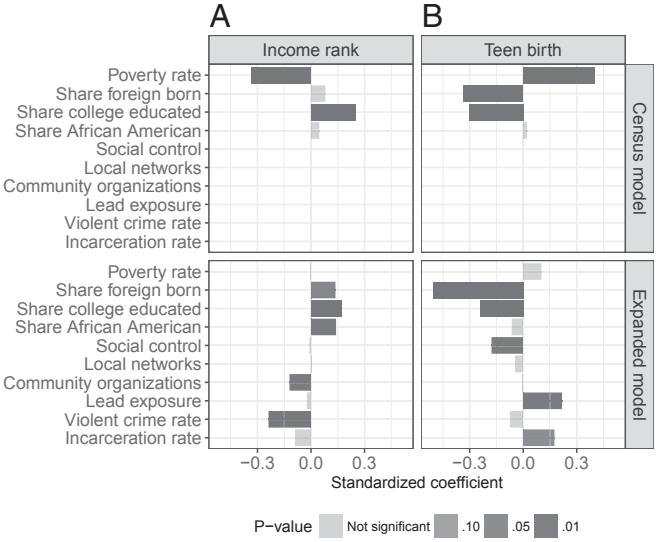

Fig. 4. Predictors of intergenerational mobility of white children: income rank (*A*), $n = 457$; female teenage birth (*B*), $n = 372$. The first block of coefficient estimates is from a standard model of Census variables, and the second block shows an expanded model, adding PHDCN variables.

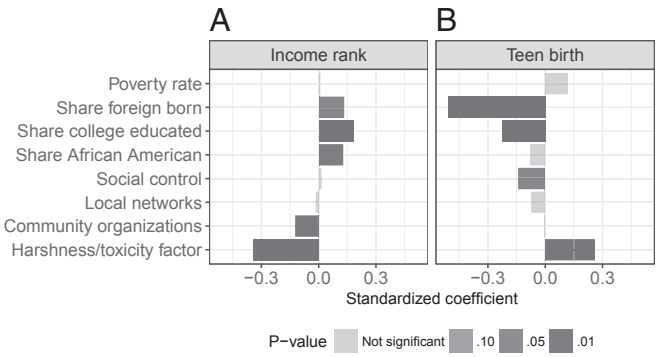

Fig. 5. Expanded model of intergenerational mobility of white children with toxicity/harshness factor. Income rank (*A*), $n = 457$; female teenage birth (*B*), $n = 372$.

and then re-estimate the expanded models in Fig. 1. In *SI Appendix*, section 10.2, we consider interaction effects between the three harshness/toxicity indicators, but they contribute little additional predictive power.

Fig. 2 shows the coefficient estimates from the factor model (see also *SI Appendix*, Table S5). Neighborhood harshness/toxicity strongly predicts variation in all three outcomes: it is associated with much lower income mobility and higher rates of teenage birth and incarceration as an adult. The strength of local networks is also a significant ($P < 0.05$) predictor of lower teenage birth rates, independent of our other neighborhood indicators and standard Census predictors. For all three outcomes, the additional explanatory power from neighborhood harshness/toxicity is statistically significant, at $P < 0.001$. The added explanatory power for our neighborhood predictors from Fig. 2 is shown in the third column within each panel of Fig. 3.

The major takeaway is that the social organizational and environmental factors, but especially the latter, add significant and meaningful explanatory power beyond standard Census characteristics. This is true whether our three measures are included as individual variables or combined into one factor.

Predictors of Mobility Outcomes for Whites. The reliability of tract-level estimates of outcomes for poor white boys is very low for some measures, likely because of the smaller numbers of poor white children living in Chicago. The reliability of incarceration estimates is near zero (0.004), for example, whereas that of income rank for poor white boys is just 0.21. Because of these low reliabilities, we do not include estimates for incarceration among white boys in our analysis, and we use pooled-sex estimates of income rank, which have a higher reliability ratio of 0.36. The reliability ratio for teenage motherhood among poor white girls is 0.54.

Results from the Census and expanded models for white children with parents at the 25th income percentile are in Fig. 4 and *SI Appendix*, Tables S6 and S8. Perhaps surprisingly, the patterns are similar to those for blacks, with the poverty rate showing relatively little explanatory power once the environmental controls are added. Although incarceration, lead exposure, and exposure to violence are highly correlated across the entire city, they are less correlated among majority white tracts, and the violent crime rate is more predictive of income rank, whereas lead exposure, and to some extent incarceration, are more predictive of teenage motherhood. Social control predicts lower teenage motherhood among white girls, whereas neighborhood organizations are modestly associated with lower income rank, all else equal.

Fig. 5 shows that the summary indicator of toxic/harsh environments similarly predicts white income rank and teenage birth among white girls, beyond the standard account. Moreover, in both the pooled and sex-specific results for whites, the incremental power of measures beyond the Census is substantial and relatively greater than for blacks. For income rank, the R^2 increases by 70%, from 0.37 to 0.63 ($P < 0.0001$), whereas for teenage motherhood, it increases from 0.39 to 0.55, a rise of 40% ($P < 0.0001$).

In *SI Appendix*, section 10 and Tables S9 and S10, we present a series of robustness checks for the main results in Figs. 1–5. These include adjustments for the measurement timing of neighborhood incarceration to address endogeneity concerns (*SI Appendix*, section 10.1); interactions among toxicity variables (*SI Appendix*, section 10.2); alternative measures of punishing environments (the rate of reported drug-related crimes and the police arrest rate; *SI Appendix*, section 10.3); alternative controls for the density of nonprofit organizations, as opposed to survey-reported organizations, and same-race father presence, which earlier research found predicts positive outcomes (18) and is arguably a proxy for the tract prevalence of incarcerated fathers in our sample (*SI Appendix*, section 10.4); and a series of spatial models adjusting for spatial autocorrelation (*SI Appendix*, section 10.5). The main results are consistent.

Racialized Exposure to Neighborhood Toxicity. From our results to this point, certain characteristics of neighborhood physical and social environments are important in explaining variation in outcomes among black children and white children. In particular, exposure to harsh and punishing environments, whether violence, incarceration, or lead, accounts for a substantial portion of the explanatory power often attributed to neighborhood poverty or single-parent households. Given this finding, we now ask whether Chicago's residential segregation is disproportionately exposing its black children to neighborhoods that are hazardous to their development. It is.

Although punishing and toxic environments predict social mobility for both black and white children, exposure levels vary enormously by race. Fig. 6 shows that there is essentially no overlap between the harshness/toxicity levels experienced by Chicago's black children and those experienced by its white children during the 1990s. Of the 292 majority black tracts in our sample, 273 had harshness/toxicity levels above the citywide mean. Just 7 of the 263 majority white tracts exceeded that level. This difference in exposure is potentially decisive. Based on our coefficient estimates reported in Fig. 2, if the black boys in our sample had been exposed to the distribution of toxicity that the white boys in our sample encountered, their mean likelihood of incarceration after controlling for parent income would have been 5.8%, rather than 11.7% in reality, compared with 1.7% for whites. The predicted income rank of black boys in our sample would have risen by 4 percentiles, from the 36th to 40th percentile, compared with the 52nd percentile for whites. The predicted likelihood of teenage motherhood for black girls in our sample would have fallen from 54% to 44% compared with 13% for white girls (see also *SI Appendix*, section 9).

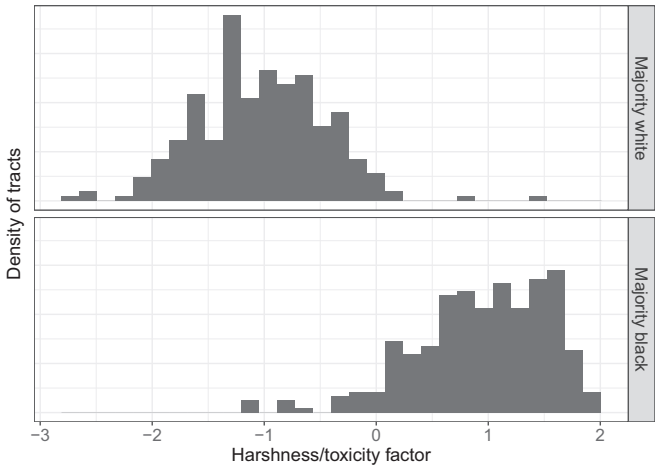

Fig. 6. Harsh/toxic environmental exposure by race. Majority black ($n = 292$) and majority white ($n = 263$) Census tracts.

Harsh and toxic environments are also associated strongly and directly with lower income mobility for whites and higher rates of teenage birth among white girls, but the levels of toxicity in white neighborhoods in Chicago are qualitatively different from those in black neighborhoods. The same is not true for neighborhood social organization (*SI Appendix*, Fig. S3).

Discussion

Researchers studying neighborhood effects have been concerned with establishing causal identification of the effects of concentrated poverty, estimating whether exposure to neighborhood poverty is driving differences in life outcomes, as opposed to individual poverty or unobserved differences between residents of different areas. Although that is a crucial step, our findings highlight another source of potential bias: that the mechanisms by which neighborhood context affects outcomes may not be properly specified. In places in which many different forms of disadvantage intersect, such as in poor and highly segregated neighborhoods, it can be difficult to determine exactly which features of the environment are driving the results, or whether it is a reinforcing combination of features beyond poverty (25).

By combining a fuller set of measures of neighborhood context and child outcomes, we have shown that theoretically relevant aspects of the social and physical environment, most notably exposure to violence, lead, and incarceration, directly predict lower intergenerational income mobility, adult incarceration, and teenage birth among children who grow up poor. Although the magnitude of association and the explanatory power of toxicity is similar for blacks and whites, exposure levels, in Chicago at least, are markedly different: the most-exposed white tracts in our sample had levels comparable to the least-exposed black tracts, potentially accounting for racial disparities in social mobility.

Organizational features of neighborhoods (social control, local networks, and community organizations) have weaker direct associations, although for blacks, high levels of local networks predict lower teenage birth, and for whites, neighborhood social control predicts teenage birth. In addition, for whites more so than for blacks, the combined toxic/harsh environment and social organizational variables contribute substantial explanatory power above and beyond the Census.

There are qualifications to our analysis, including the inability to measure neighborhood features earlier in life and imprecision in some of our measures. The social survey measures, for example, are based on small samples within each tract, compared with the population-level estimates of other variables. That alone could account for their weaker power in predicting social mobility. We also do not claim causal estimates for our measures of organizational and environmental features, including toxicity, either as independent factors or as mediators for concentrated poverty.

That said, the factors we introduce are not coterminous with standard Census measures, and they show clear added value: Including measures of punishing environments and supportive social organization significantly increases the explanatory power of statistical models predicting mobility outcomes by at least 17%, and often much more. There is also reason to think these patterns extend beyond Chicago and have causal relevance, at least at higher levels of analysis. At the Commuting Zone level, prior research that does estimate causality finds that areas with higher exposure to crime have worse mobility outcomes for kids (8).

We conclude that although commonly used Census indicators predict the social mobility of children, consistent with Chetty et al. (18, 19), at least in Chicago, such measures are capturing important associations that stem from the social and physical environment of neighborhoods. Adding these latter features significantly negates traditional Census variables in predicting mobility. It follows that future research on social mobility, including causal mediation models, should probe the salient neighborhood social and environmental features to which children are exposed, moving beyond Census characteristics such as concentrated poverty and demographic composition.

Our results further imply that the neighborhood clustering of toxic and harsh environments is particularly harmful to the physical and mental well-being of children, which in turn undermines key dimensions of social mobility later in life. This process is distinct from more familiar arguments about the blocked opportunities or inadequate investment in human capital that result from concentrated poverty, motivating alternative ways to think about policy. Past interventions that have cleaned up the physical environment and reduced toxic hazards indicate that environmental policy is in part crime policy (14, 26, 27). Our results suggest a broader conclusion: Reducing violence, reforming criminal justice through deincarceration, and maintaining environmental health together make for social mobility policy.

ACKNOWLEDGMENTS. We thank the PNAS reviewers, Raj Chetty, and Nathan Hendren for helpful suggestions. We also gratefully acknowledge support from the Project on Race, Class and Cumulative Adversity at Harvard University, funded by the Ford Foundation and the Hutchins Family Foundation.

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